24. local extrema, inc, dec

$g(x) = x^{\frac{1}{3}}(x+8)$

1. $g'(x) = x^{\frac{1}{3}}(1) + (x+8)\frac{1}{3}x^{-\frac{2}{3}} = 0$ solve for x

$\left(\sqrt[3]{x} + \frac{x+8}{3\sqrt[3]{x^2}} = 0\right) 3\sqrt[3]{x^2}$

$3\sqrt[3]{x^3} + x + 8 = 0$ $x = -2$

$4x + 8 = 0$ $y = -7.559$

2. $f' = *$ $x = 0$ $y = 0$

3. endpts: none

g' $-$ 0 $+$ $*$ $+$

-2 0

dec on $(-\infty, -2]$

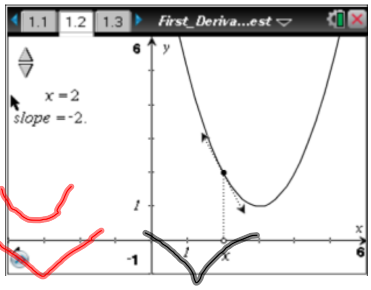
Inc on $[-2, \infty)$

Oct 14-9:28 AM

4.3 Connecting f ' and f '' with the graph of f

first derivative test for local extrema of continuous functions

If f' changes from neg to pos then f has a min



$-0+$

$-*+$

If f' changes from pos to neg then f has a max

$+*-$

$+0-$

f' $-0-$

f' $+0+$

f' $-*-$

f' $+*+$

Oct 18-5:28 PM

find the local extrema:

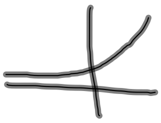
y=(x^2 - 3) e^x

y': $+$ 0 $-$ 0 $+$ (at -3 and 1)

$y' = (x^2-3)e^x + e^x \cdot 2x = 0$

$e^x(x^2-3+2x) = 0$

$e^x = 0$ or $x^2+2x-3=0$



never

$(x-1)(x+3)=0$

1. $x=1$ $x=-3$

   $y=-2e$ $y=\frac{6}{e^3}$

2. $f' = \nexists$ none

3. endpts none

$x=1$ $y=-5.436$ min

$x=-3$ $y=.298$ max

max because f' changes from pos to neg

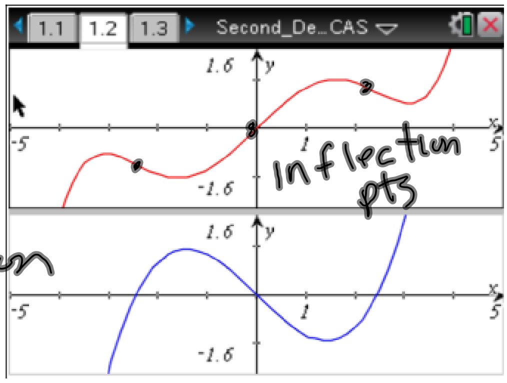
min because f' changes from neg to pos

Oct 18-6:24 PM

concavity test

$f''>0$, f concave up

$f''<0$, f concave down



inflection point:

f changes concavity

f'' changes sign

Oct 18-6:25 PM

Find all points of inflection for the graph of $y = e^{-x^2}$

$\left(-\sqrt{\frac{1}{2}},\ e^{-\frac{1}{2}}\right)$

$\left(\sqrt{\frac{1}{2}},\ e^{-\frac{1}{2}}\right)$

$y' = e^{-x^2}(-2x)$

$y'' = e^{-x^2}(-2) + (-2x)e^{-x^2}(-2x) = 0$

$= e^{-x^2}\left(-2 + 4x^2\right) = 0$

y'' + 0 − 0 +

$-\sqrt{\frac{1}{2}}$ $\sqrt{\frac{1}{2}}$

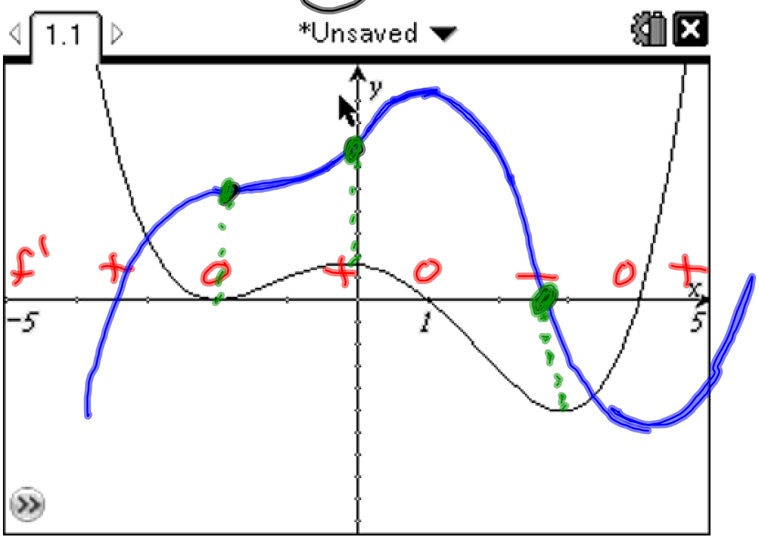
$4x^2 = 2$

$x^2 = \frac{2}{4}$

$x = \pm\sqrt{\frac{1}{2}}$

Oct 18-6:26 PM

This is the graph of f '. Sketch a possible graph of f



Oct 18-6:28 PM

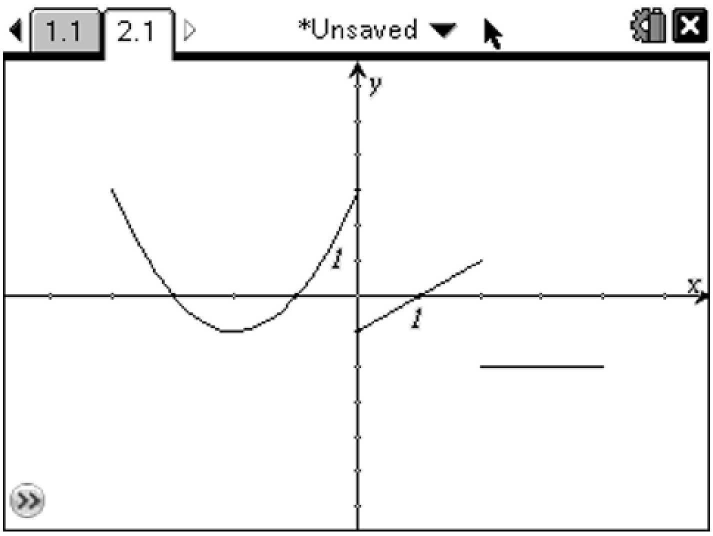
second derivative test for local extrema

Find the local extrema using the second derivative test

y=x^3 -12x - 5

Oct 18-6:34 PM

Given the graph of f ' sketch a possible graph of f



Oct 18-6:41 PM